

Notice of Allowability

Application No.

10/665,447

Applicant(s)

KANEKO, TSUYOSHI

Examiner

Phillip Nguyen

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 6/9/06.
2. ☒ The allowed claim(s) is/are 1-11 and 13-21.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some* c) ☐ None of the:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date 7/6/06.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Kurt Goudy on July 6th, 2006.

2. The application has been amended as follows:

In the claims:

Claim 3. A surface emitting semiconductor laser including a resonator formed on a substrate and emitting a laser beam toward a direction vertical to the substrate from an emitting surface formed on an upper surface of the resonator, comprising:

a first electrode and a second electrode being formed on the upper surface of the resonator, at least a part of the first electrode being formed on the upper surface of the resonator, the resonator including a first mirror formed above the substrate, an active layer, and a second mirror located oppositely to the first mirror and sandwiching the active layer therebetween;

an aperture that is formed on the upper surface of the resonator, the emitting surface being formed on the upper surface of the resonator within the aperture, and a reflectivity adjustment layer being formed in the emitting surface; and

a thickness of the reflectivity adjustment layer varies;

the second mirror including a layer of which the optical thickness is $m_1 \lambda/2$ (m_1 , a natural number > 0), when a wavelength of the laser beam is λ , the layer of which the optical thickness is $m_1 \lambda/2$ is formed in whole area of the second mirror, the reflectivity adjustment layer is formed within a part of the aperture.

Claim 4. The surface emitting semiconductor laser claimed in 3, ~~the resonator including a first mirror formed above the substrate, an active layer, and a second mirror located oppositely to the first mirror and sandwiching the active layer therebetween; and~~ reflectivity of the laser beam in a first region being larger than the reflectivity of the laser beam in a second region, when the first region is defined as a region comprising the reflectivity adjustment layer and a lower region of the reflectivity adjustment layer in the second mirror, and the second region is defined as a region except the first region in the second mirror.

Claim 5. The surface emitting semiconductor laser claimed in claim 4, ~~the second mirror including a layer of which the optical thickness is $m_1 \lambda/2$ (m_1 , a natural number > 0), the optical thickness of the reflectivity adjustment layer is $(2m_2-1) \lambda/4$ (m_2 , a natural number > 0), when a wavelength of the laser beam is λ .~~

Claim 18. A method of manufacturing a surface emitting semiconductor laser including a resonator formed on a substrate and emitting a laser beam toward a direction vertical to the substrate from an emitting surface formed on an upper surface of the resonator, comprising:

forming a resonator on the substrate;

forming a layer of which an optical thickness is $m_1 \lambda/2$ (m_1 , a natural number > 0) in the second mirror; and

forming a reflectivity adjustment layer of which an optical thickness is $(2m_2-1) \lambda/4$ (m_2 , a natural number > 0),

forming the layer of which the optical thickness is $m_1 \lambda/2$ in whole area of the second mirror, and forming the reflectivity adjustment layer within a part of an aperture formed on the upper surface of the resonator.

Claim 20. A method of manufacturing a surface emitting semiconductor laser including a resonator formed on a substrate and emitting a laser beam toward a direction vertical to the substrate from an emitting surface formed on an upper surface of the resonator, comprising:

forming a resonator on the substrate;

forming a first electrode and a second electrode to inject a current into the resonator, at least a part of the electrode being formed on the upper surface of the resonator and an aperture is formed on the upper surface of the resonator,

Art Unit: 2828

forming a first mirror above the substrate, an active layer, and a second mirror located oppositely to the first mirror and sandwiching the active layer therebetween, and forming a reflectivity adjustment layer on the emitting surface, wherein a thickness of the reflectivity adjustment layer varies,

forming on the second mirror a layer of which the optical thickness is $m_1 \lambda/2$ (m_1 , a natural number > 0), when a wavelength of the laser beam is λ , the layer of which the optical thickness is $m_1 \lambda/2$ is formed in whole area of the second mirror, the reflectivity adjustment layer is formed within a part of the aperture.

Election/Restrictions

3. Claims 1-17 are directed to an allowable product. Pursuant to the procedures set forth in MPEP § 821.04(B), claims 18-21, directed to the process of making or using an allowable product, previously withdrawn from consideration as a result of a restriction requirement, are hereby rejoined and fully examined for patentability under 37 CFR 1.104.

Because all claims previously withdrawn from consideration under 37 CFR 1.142 have been rejoined, the restriction requirement as set forth in the Office action mailed on 7/20/2005 is hereby withdrawn. In view of the withdrawal of the restriction requirement as to the rejoined inventions, applicant(s) are advised that if any claims including all the limitations of an allowable product claim or rejoined process claim are presented in a continuation or divisional application, such claims may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Once the restriction requirement is

Art Unit: 2828

withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 443 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

Allowable Subject Matter

4. The following is an examiner's statement of reasons for allowance: Claims 1-11 and 13-21 are allowed because the prior art fail to teach or fairly suggest a VCSEL with the reason indicated in Applicant's Response, received on 6/9/2006, pages 8-9.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Communication Information

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phillip Nguyen whose telephone number is 571-272-1947. The examiner can normally be reached on 9:00 AM - 6:00 PM.

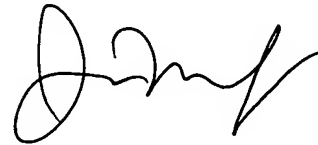
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MINSUN HARVEY, can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2828

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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AU 2828

A handwritten signature in black ink, appearing to read 'J. Menefee', with a stylized flourish at the end.

**JAMES MENEFEE
PRIMARY EXAMINER**